Chemicals Notes and Oxydations
[A short Note about the Langmuir System].

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Abstract

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1 Introduction

Let introduce $CH3CO2H$ also known as $CH3COOH$ is the chemical formula for **acetic acid**. His Systematic Name is the Ethanoic Acid :

- His Molecular formula : $C_2H_4O_2$,
- His Acidity (pK_a) : 4,76

2 Training

[***Reminder: In the following questions, where appropriate, input your answer as a numerical value. If you wish to use scientific notation, please use the following format***].

The number 1.8×10^{25} should be written "1.8e25" or as "1.8*10^{25}".

2.1 Conversion and Rounding Method

Convert 55.8 minutes to seconds. Round the answer to three digits.
Computation : $55.8 \times 60 = 3348 = 3.35e3$.

2.2 Scientific Notation

Express the result of $(4.44 \times 10^{-5}) \times (4.93 \times 10^{13})$ in scientific notation rounded to three digits :

$$(4.44 \times 10^{-5}) \times (4.93 \times 10^{13}) = 21.9 \times 10^{8}$$

2.3 Give an example of a compound.

1. Mashed Potatos and gravy
2. YES, laughing gas is a chemical compound known as nitrous oxide. It has the formula N_2O. This means it is made of two nitrogen atoms and one oxygen atom bound together. here.
3. Aluminium foil here,
4. **Vanilla cake batter is a mixture**, not a chemical compound. In chemistry, a compound has a fixed ratio of elements bonded by chemical bonds. Cake batter consists of distinct physical ingredients like flour, sugar, butter, and milk that retain their own chemical identities

2.4 Homogenous Mixtures

- Pure chromium is a chemical element with the Symbol Cr and atomic number 24, making it a pure substance rather than a mixture.
- Alloys: When chromium is mixed uniformly with other metals like iron and nickel, it forms a homogeneous mixture called an alloy (such as stainless steel).

- THere is a difference in terms of component: While alloys containing chromium are homogeneous mixtures, the pure chromium metal used to make them is a foundational element.
- Sodium peroxide is a pure chemical compound, not a homogeneous mixture.
-
- Sodium peroxide has the formula Na_2O_2 and is a pure chemical compound, meaning it has a fixed chemical structure and formula rather than varying components like a mixture.Ozone (O_3) is a pure form of an element made only of oxygen atom.
- Commercially, sodium peroxide is produced from the elements in a two-stage process. First sodium is oxidized to sodium oxide:

$$4Na + O_2 \rightarrow 2Na_2O$$

$$2Na_2O + O_2 \rightarrow 2Na_2O_2$$

- Sodium Peroxide can be obtained when sodium hydroxide is treated with hydrogen peroxide, here.

$$2NaOH + H_2O_2 \rightarrow Na_2O_2 + 2H_2O$$

- YES: Regular unleaded gasoline is a homogeneous mixture because its components are mixed evenly, exist in a single liquid phase, and look the same throughout. here,
- Paper confetti is a collection of tiny, brightly colored shapes cut from paper, used for throwing, scattering, or launching at celebrations, here.

2.5 Physical vs. Chemical Changes

References: link-1, link-2, link-3, link-4-a-Quiz,

1. Is glass shattering a physical or chemical change?
   - YES: It is a Physical Change.
2. Is a copper statue turning green a physical or chemical change? [figure 1]
   - YES: It is a Chemical Change.

2.6 Number of Moles with the Avogadro Number: $N_A = 6.02214 \times 10^{23}$

- Average Atomic Mass per mole for [Sulfur, S] : $32.0650 \frac{g}{mol}$.
- Average Atomic Mass per mole for [Potassium, K]: $39.0983 \frac{g}{mol}$.

The number of particles in a mole is The Avogadro number.
We can use Avogadro's constant to calculate the number of atoms or molecules from the number of moles or vice versa, using the following relationship:

$$\text{number of atoms or molecules} = N_A \times \text{number of moles}$$

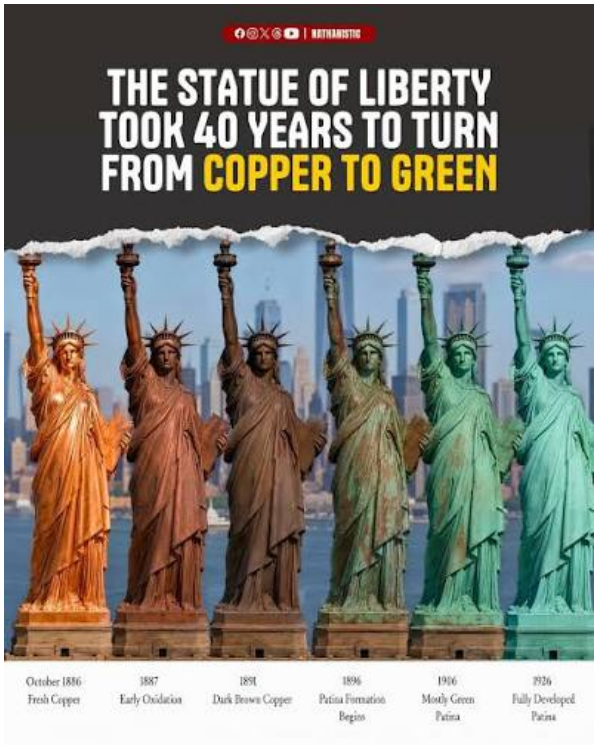

Figure 1: Statue of Liberty, from Copper to Green

2.6.1 Molar masses of element, [here]

The molar mass $M(\mathrm{X})$ of atoms of an element X is given by the relative atomic mass $A_\mathrm{r}(\mathrm{X})$ of the element multiplied by the molar mass constant, M_u, which (for all practical purposes) is equal to 1 g/mol: $M(\mathrm{X}) = A_\mathrm{r}(\mathrm{X}) \cdot M_\mathrm{u}$. For normal samples from Earth with typical isotope composition, the atomic weight can be approximated by the standard atomic weight[2] or the conventional atomic weight.

$$
\begin{aligned}
M(\mathrm{He}) &= 4.002602(2) \times M_\mathrm{u} = 4.002602(2)\ \mathrm{g/mol} \\
M(\mathrm{Ne}) &= 20.1797(6) \times M_\mathrm{u} = 20.1797(6)\ \mathrm{g/mol} \\
M(\mathrm{Fe}) &= 55.845(2) \times M_\mathrm{u} = 55.845(2)\ \mathrm{g/mol} \\
M(\mathrm{Cu}) &= 63.546(3) \times M_\mathrm{u} = 63.546(3)\ \mathrm{g/mol} \\
M(\mathrm{Ag}) &= 107.8682(2) \times M_\mathrm{u} = 107.8682(2)\ \mathrm{g/mol}
\end{aligned}
$$

Multiplying by the molar mass constant ensures that the calculation is dimensionally correct: relative atomic masses and standard atomic weights are dimensionless quantities (i.e., pure numbers), whereas molar masses have units (in this case, grams per mole).

Some elements are usually encountered as molecules, e.g. hydrogen ($\mathrm{H_2}$), nitrogen ($\mathrm{N_2}$), oxygen ($\mathrm{O_2}$), sulfur ($\mathrm{S_8}$), chlorine ($\mathrm{Cl_2}$). The molar mass of molecules of these elements is the molar mass of the atoms multiplied by the number of atoms in each molecule:

$$
\begin{aligned}
M(\mathrm{H_2}) &= 2 \times 1.00794(7) \times M_\mathrm{u} = 2.01588(14)\ \mathrm{g/mol} \\
M(\mathrm{N_2}) &= 2 \times 14.0067(2) \times M_\mathrm{u} = 28.0134(4)\ \mathrm{g/mol} \\
M(\mathrm{O_2}) &= 2 \times 15.9994(3) \times M_\mathrm{u} = 31.9988(6)\ \mathrm{g/mol} \\
M(\mathrm{S_8}) &= 8 \times 32.065(5) \times M_\mathrm{u} = 256.52(4)\ \mathrm{g/mol} \\
M(\mathrm{Cl_2}) &= 2 \times 35.453(2) \times M_\mathrm{u} = 70.906(4)\ \mathrm{g/mol}
\end{aligned}
$$

Application to chemistry: The number of moles n is $\frac{71.7}{32.0650+2\times39.0983} = 0.6502717174 = 6.503e-1$

Molar masses of compounds

Main article: Molecular mass Calculation
The molar mass $M(\mathrm{X})$ of a compound is given by the sum of the relative atomic masses $A_r(\mathrm{X}_i)$ of the elements (each multiplied by the number of atoms n_i per element) which form the compound multiplied by the molar mass constant, $M_\mathrm{u} \approx 1$ g/mol:

$$M(\mathrm{X}) = M_r(\mathrm{X}) \cdot M_\mathrm{u} = M_\mathrm{u} \sum_i n_i A_r(\mathrm{X}_i).$$

Here, $M_r(\mathrm{X})$ is the relative molar mass, also called molecular weight or formula weight. For normal samples from Earth with typical isotope composition, the standard atomic weight or the conventional atomic weight can be used as an approximation of the relative atomic mass of the sample. Examples are:

$$\begin{aligned} M(\mathrm{NaCl}) &= [22.8976928(2) + 35.453(2)] \times M_\mathrm{u} \\ &= 58.443(2) \text{ g/mol} \\ M(\mathrm{C_{12}H_{22}O_{11}}) &= [12 \times 12.0107(8) + 22 \times 1.00794(7) + 11 \times 15.9994(3)] \times M_\mathrm{u} \\ &= 342.297(14) \text{ g/mol} \end{aligned}$$

2.6.2 Average molar mass of mixtures

An average molar mass may be defined for mixtures of substances.[1] This is particularly important in polymer science, where there is usually a molar mass distribution of non-uniform polymers so that different polymer molecules contain different numbers of monomer units.[3][4] The average molar mass of mixtures $\overline{M}$ can be calculated from the mole fractions x_i of the components and their molar masses M_i:

$$\overline{M} = \sum_i x_i M_i.$$

It can also be calculated from the mass fractions w_i of the components:

$$\frac{1}{\overline{M}} = \sum_i \frac{w_i}{M_i}.$$

As an example, the average molar mass of dry air is 28.9647 g/mol.[5]
[Some References]: link-1, link-2,

2.7 The Laws of Definite and Multiple Proportions

Calculate the percent by mass of hydrogen in acetic acid, , using the molar masses given below. Express the answer to four significant figures.

- The molar mass of acetic acid is: $60.05 \frac{g}{mol}$
- The molar mass of hydrogen, is : $1.0079 \frac{g}{mol}$

Method: percentage $= \frac{4 \times 1.0079}{60.05} = 0.06713738551 = 6.714\%$

2.8 Stoichiometry, [here]

Write your answer as a number only, do not include the units. Please round your answer to three significant figures.
References about : [here] [here] [here] [Stoichiometry] [Quoru Forum] [Chegg.com]

1. Remembering the Chemical Equation :

$$2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$$

2. Determine the number of Moles of Oxygen, n_o:

   According to the Equation, 2 moles of ***Octane*** requires 25 moles of Oxigen (O_2); So we have to determine how many moles of ***Oxygen*** is required for 4.72 moles of ***Octane*** [we use the correspondance rule]:

$$n_o = \frac{4.72 \times 25}{2} = 59$$

3. We know the value the Ideal Gas Constant as $R = 0.08206 \frac{\text{L}\cdot\text{atm}}{K\cdot\text{mol}}$. We have to convert the temperature in Kelvin (K) [here] :

$$T = 63.42 + 273.15 = 336.57$$

4. Final Results:

   Volume (Oxygen) $= \frac{59 \times 0.08206 \times 336.57}{1.71} = 925.8619987 = 9.26 \times 10^2$

2.9 Partial Pressure of a Component in a Mixture [here]

For the following sample of gases, calculate the partial pressures of the components. Use the ideal gas constant as $R = 0.0820573 \frac{L\ \text{atm}}{K\ \text{mol}}$.

Write your answer as a number only, do not include the units. Please round your answer to three significant figures.

Say you have another mixture of three gases: You have Neon [Ne][14.4 moles] , Ozone O_3 [15.6 moles] and NO_2 [Nitrogen Dioxide][20.3moles] . These gases are held in a vessel with constant temperature and volume and a pressure of 15.6 atm. Assume no reactions occur. Recall 1atm = 0.01325 bar.

For a non-reacting mixture of Neon (Ne), Ozone (O_3), and Nitrogen Dioxide (NO_2) held at a constant temperature and volume, the total pressure equals the sum of the partial pressures exerted by each individual gas, following Dalton's Law of Partial Pressures. [Brainly.com][here-1][here-2][here-2][here-3]

1. Look at the first component, Neon Ne, what is the Partial Pressure of Neon Ne in Bar ?

   $\chi_{Ne} = \frac{14.4}{14.4+25.4+20.3}$ represents the mole fraction of Neon gas.

   the Partial Pressure of Neon Ne in Bar is :

$$P_{Ne} = \frac{14.4}{14.4+25.4+20.3} \times 15.6 \times 1.01325 = 3.78729584 \approx 3.79$$

2. $\chi_{O_3} = \frac{25.4}{14.4+25.4+20.3}$ represents the mole fraction of Ozone O_3 gas.

   the Partial Pressure of ozone O_3 in Bar is :

$$P_{O_3} = \frac{14.4}{14.4+25.4+20.3} \times 15.6 \times 1.01325 = 6.680369052 \approx 6.68$$

3. $\chi_{NO_2} = \frac{20.3}{14.4+25.4+20.3}$ represents the mole fraction of Nitrogen Dioxyde NO_2 gas.

   the Partial Pressure of Nitrogen Dioxyde NO_2 in Bar is :

$$P_{NO_2} = \frac{20.3}{14.4+25.4+20.3} \times 15.6 \times 1.01325 = 5.339035108 \approx 5.34$$

2.9.1 Other Researches

1. Neural Network Polyhedral : [here][here], [here] [here] [here]
2. PDP-10 Machines [here] [here], [here]
3. Other Mcgill Events
4. Micro-Retro Computing : [here], [here] [here] [here]
5. Beautiful Wall Papers, etc.